GB1216439

Publication Title:

IMPROVEMENTS IN OR RELATING TO RESILIENT COUPLINGS

Abstract:

Abstract of GB1216439

1,216,439. Resilient couplings. G. SCHWARTZ & CO. 3 Sept., 1969 [14 Sept., 1968; 28 Feb., 1969], No. 43578/69. Heading F2U. In a flexible coupling comprising resilient strips 4 between the coupled members 1, 2 and of which their roots 6 are secured in grooves 5 in one of the coupled members while their crowns 8 project into recesses 7 in the other member, the root-receiving grooves 5 are of rectangular crosssection. The grooves 5 may be provided in either of the coupled members and the crowns of the strips 4 may be tapered as shown, or of partcircular section.

PATENT SPECIFICATION (11) 1 216 439

1 216 439

DRAWINGS ATTACHED

(21) Application No. 43578/69 (22) Filed 3 Sept. 1969
(31) Convention Application No. G 67 50 281
(32) Filed 14 Sept. 1968
(31) Convention Application No. P 19 10 126.9
(32) Filed 28 Feb. 1969 in
(33) Germany (DT)
(45) Complete Specification published 23 Dec. 1970
(51) International Classification F 16 d 3/00
(52) Index at acceptance
F2U 236 239 302 562

(54) IMPROVEMENTS IN OR RELATING TO RESILIENT COUPLINGS

(71) We G. SCHWARTZ & Co., a German Company, of 4000 Düsseldorf 1, Marienstrasse 20, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to resilient gear couplings comprising an inner gear member, an outer gear member co-axially surrounding the inner gear member, and teeth of an elastic material which have their roots secured in grooves in one of said gear members and have their crowns projecting into recesses in the other gear member for driving engagement therewith.

Resilient gear couplings of this generic type are already known. In such known resilient gear couplings the roots of the teeth are secured in one of the gear members by means of a dove-tail connection; i.e. the grooves for the roots of the teeth and the roots of the teeth themselves are of trapezoidal cross-section, with the longer of the two parallel sides of the trapezium remote from the common boundary between the gear members. It will be evident that with this form of construction the prime consideration is to retain the teeth in their grooves against any radially exerted forces, particularly if the roots of the teeth are fixed in the inner gear member. However, this construction gives rise to two particular disadvantages, firstly that the dove-tailed grooves cannot be formed in a single working step, and secondly that the insertion of the roots of the teeth into the grooves can only be effected axially of the gear members and from the front of the gear coupling.

The present invention is based on the principle of providing a resilient gear coupling in which only tangential forces are exerted on the teeth of the coupling in the transmission of a turning moment. Radial forces can only arise in the form of centrifugal forces. These radial forces have no effect on teeth secured in the outer gear member, since they tend to force the roots of the teeth further into the grooves of the gear member. Alternatively, if the teeth are secured in the inner gear member the radial forces can achieve nothing, since they only attempt to force the crowns of the teeth into the recesses in the outer gear member, this being desirable since the crowns of the teeth should preferably have the greatest possible surface area within the recesses in the outer gear member for the transmission of a turning moment. This means that the greater area of contact between the roots of the teeth and the grooves provided by the known dove-tailed connection is of no significance in the transmission of turning moments, since for the transmission of such moments only the tooth surface perpendicular to the tangential forces which produce the turning moment serves as an effective surface in the operation of the gear coupling.

It is therefore an object of the present invention to provide a resilient gear coupling of the generic type firstmentioned above in which the grooves which receive the roots of the teeth are so shaped that they can be formed more easily, and in which the teeth can more easily be inserted into the grooves, without the efficiency and satisfactory operation of the coupling being in any way impaired.

This is achieved in accordance with the present invention in that the grooves for receiving the roots of the teeth are formed with a rectangular cross-section.

In the resilient gear coupling of the present invention each groove for the root of a tooth is rectangular in cross-section perpendicular to the central longitudinal axis of the coupling. Preferably, the overall shape of each groove is a parallelepiped. This pro-

vides a real improvement as compared with grooves of dove-tailed shape, firstly because the grooves can be formed in a single machining step, and secondly because the roots of the teeth can be fitted into the grooves radially, and, in repairing the coupling, can similarly be removed radially from the grooves. This is self-evidently easier than having to fit the roots of the teeth axially into the grooves. It also means that in the transmission of turning moments the effective surface of the roots of the teeth lies exactly perpendicular to the forces exerted by the groove walls. The danger of a tooth becoming displaced from its groove, which could in any event only arise with couplings of this type in which the roots of the teeth are secured in the inner gear member, does not in fact arise, since the roots of the teeth are formed of an elastic material and are fitted into the grooves under tension, and since the crowns of the teeth fit into the recesses in the other gear member during rotation of the coupling in such manner that no movement of the teeth in a radial direction is possible.

In the gear couplings of the present invention teeth of different lengths can be inserted into the grooves. For this reason, each groove is initially formed so that teeth of different lengths can be fitted into it, i.e. a groove can be fitted with any tooth from one of the smallest possible effective length up to one with a length which is equal to the length of the groove. Teeth with the smallest possible length result in the minimum shearing moment between the parts of the coupling, and teeth with the greatest possible length result in the maximum shearing moment. Within these limits the coupling can be designed to give any desired shearing moment when it is assembled, and this makes the coupling particularly suitable as a safe coupling for the most widely varying loadings.

A number of embodiments of gear coupling in accordance with the invention will now be described by way of example and with reference to the accompanying drawings, in which:

Fig. 1 is a cross-sectional view through a resilient gear coupling in which the roots of the teeth are secured in the inner gear member and the recesses in the outer gear member which receive the crowns of the teeth are of trapezoidal cross-section;

Fig. 2 is a sector from a cross-sectional view through a resilient gear coupling with a tooth structure as in Fig. 1 but with the roots of the teeth secured in the outer gear member;

Fig. 3 is a sector from a similar cross-sectional view through a resilient gear coupling in which the roots of the teeth are secured in the inner gear member and the recesses in the outer gear member which receive the crowns of the teeth are part-circular in section;

Fig. 4 is a sector from a similar cross-sectional view through a resilient gear coupling with a tooth structure as shown in Fig. 3 but with the roots of the teeth secured in the outer gear member; and,

Fig. 5 is an axial section through a tooth which is fitted into a flanged coupling.

The resilient gear coupling shown in Fig. 1 comprises an inner gear member 1, whose outer peripheral surface is basically cylindrical, and an outer gear member 2 whose inner peripheral surface is also basically cylindrical and which is arranged co-axially with respect to the inner gear member 1. An air gap 3 is formed between the inner gear member 1 and the outer gear member 2. The transmission of a turning moment from the inner gear member 1 to the outer gear member 2 or vice-versa is effected by means of teeth 4 of an elastic material, generally a synthetic plastics material or synthetic or natural rubber. To retain the teeth 4 the inner gear member 1, in Figs. 1, 3 and 5, or the outer gear member 2, in Figs. 2 and 4, is provided with grooves 5, in each of which the root 6 of a tooth is fitted. Facing each groove 5 and having a depth equal to that of the grooves, recesses 7 are provided in the outer gear member 2, in Figs. 1, 3 and 5, or in the inner gear member 1, in Figs. 2 and 4, and each of these recesses 7 receives the crown 8 of the associated tooth.

Each groove 5 is rectangular in cross-section perpendicular to the central longitudinal axis of the coupling; overall, each groove is shaped as a parallelepiped. Correspondingly, the roots 6 of the teeth after insertion into the grooves 5 are likewise of rectangular form. On the other hand, the recesses 7 are shaped differently. Each recess 7, perpendicular to the central longitudinal axis of the coupling, is either trapezoidal in cross-section as in Figs. 1 and 2, or is part-circular, as in Figs. 3 and 4. Recesses of other cross-section, for example segments of ellipses, are also included within the scope of the present invention. The crowns 8 of the teeth are shaped to be received in the recesses 7, but they have a slightly smaller cross-section as compared with the recesses in order to ensure that the two gear members can be assembled one within the other in the axial direction without damage.

In the embodiment illustrated in Fig. 5 in which the teeth 4 are part of a flanged coupling, the outer gear member 2, here shown as a flanged sleeve, is connected to a flanged hub 12 by means of a screw connection 11 which is not shown in detail. On the end remote from the flanged hub 12 the outer gear member 2 has a limit ring 13 secured thereto. The grooves 5 provided in the inner gear

member 1, here shown as a drive member, each hold one of the teeth 4. The teeth 4 in this embodiment have a smaller length than the grooves 5 in which they are fitted. Alternatively, teeth 4 which have a length equal to that of the grooves 5 can be fitted into the grooves. The maximum length of the teeth 4 is determined by the length of the grooves 5, and this is itself adapted to the size of the outer gear member 2 having the limit ring 13 projecting radially inwardly at its free end. For a particular length of the teeth 4 the coupling has a given shearing moment. This shearing moment can be altered by the use of teeth of a different length. It is thus possible when assembling the coupling to adapt the coupling to the particular shearing moment which is desired, and this is of particular importance if it is to be used as a safety coupling.

The manufacture and assembly of the resilient toothed gear coupling of the present invention is extremely simple. The grooves 5 which receive the roots 6 of the teeth are machined in the appropriate inner or outer gear member in a single working step, for example by milling. Likewise, the recesses 7 in the other gear member are similarly formed by a single machining operation. This avoids any subsequent need to machine the walls of the grooves as is necessary with grooves of dove-tailed form. After this, the teeth 4 have their roots 6 forced radially into the grooves 5. All that is then necessary is to fit the outer gear member 2 co-axially over the inner gear member 1, and, if present, to fit the limit ring 13 on to the end of the outer gear member 2, and the coupling is then complete. In removing the teeth from their seats in the grooves a tool can be inserted between the bottom of the groove 5 and the base of the tooth, and the tooth can then be forced radially out of the groove. This avoids the troublesome insertion and removal of the teeth axially, as has previously been necessary with dove-tailed grooves and teeth.

Besides the length of the teeth, the number of teeth is also of importance in relation to the turning moment to be transmitted. For reasons of ease of illustration, four teeth 4 are shown in the embodiment illustrated in Fig. 1. As Fig. 5 shows, the inner gear member 1 need not, as shown in Figs. 1 to 4 for reasons of simplicity, be formed as a solid shaft, but can alternatively take the form of a hollow sleeve.

The resilient toothed gear coupling of the present invention finds general utilisation in any situation where two machine components need to be coupled for co-rotation by a positive connection. The toothed coupling may be formed as a flanged coupling as in Fig. 5, or even as a plug and socket type coupling.

WHAT WE CLAIM IS:

1. A resilient gear coupling comprising an inner gear member, an outer gear member co-axially surrounding said inner gear member, and teeth of an elastic material which have their roots secured in grooves in one of said gear members and have their crowns projecting into recesses in the other gear member, wherein the grooves which receive the roots of the teeth are of rectangular cross-section.

2. A resilient gear coupling as claimed in claim 1, in which the recesses in which the crowns of the teeth are received are of trapezoidal cross-section with the shorter of the two parallel sides remote from the roots of the teeth.

3. A resilient gear coupling as claimed in claim 1, in which the recesses in which the crowns of the teeth are received are of part-circular cross-section.

4. A resilient gear coupling as claimed in any preceding claim, in which teeth of different lengths can be fitted into the grooves.

5. A resilient gear coupling substantially as hereinbefore described with reference to Fig. 1, or Fig. 1 as modified by any of Figs. 2 to 5, of the accompanying drawings.

POLLAK, MERCER & TENCH,
Chartered Patent Agents,
Audrey House, Ely Place,
London, E.C.1.

Agents for the Applicants.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1970.
Published at the Patent Office, 25 Southampton Buildings, London WC2A 1AY from which copies may be obtained.

1,216,439 COMPLETE SPECIFICATION
2 SHEETS
This drawing is a reproduction of the Original on a reduced scale.
SHEET 1

Fig. 1

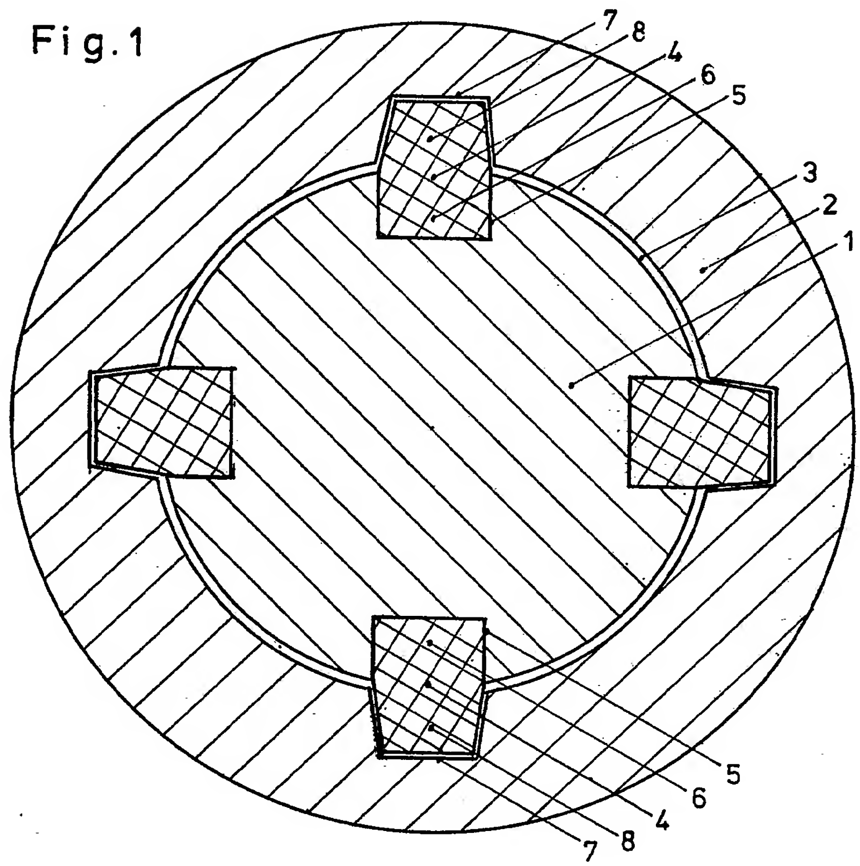


Fig. 2

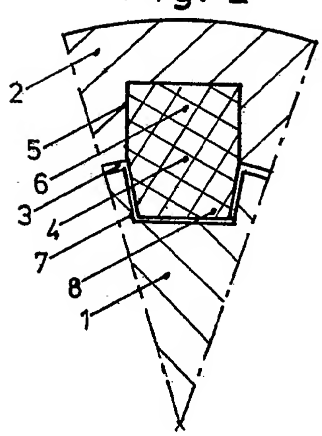


Fig. 3

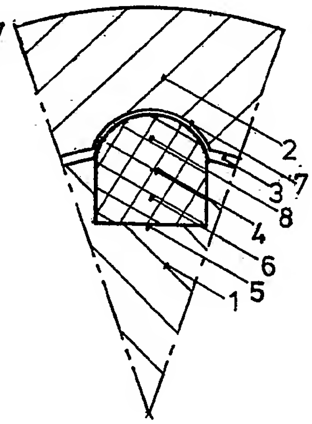
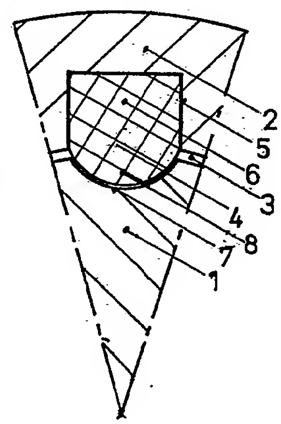


Fig. 4



1,216,439 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale.*
SHEET 2

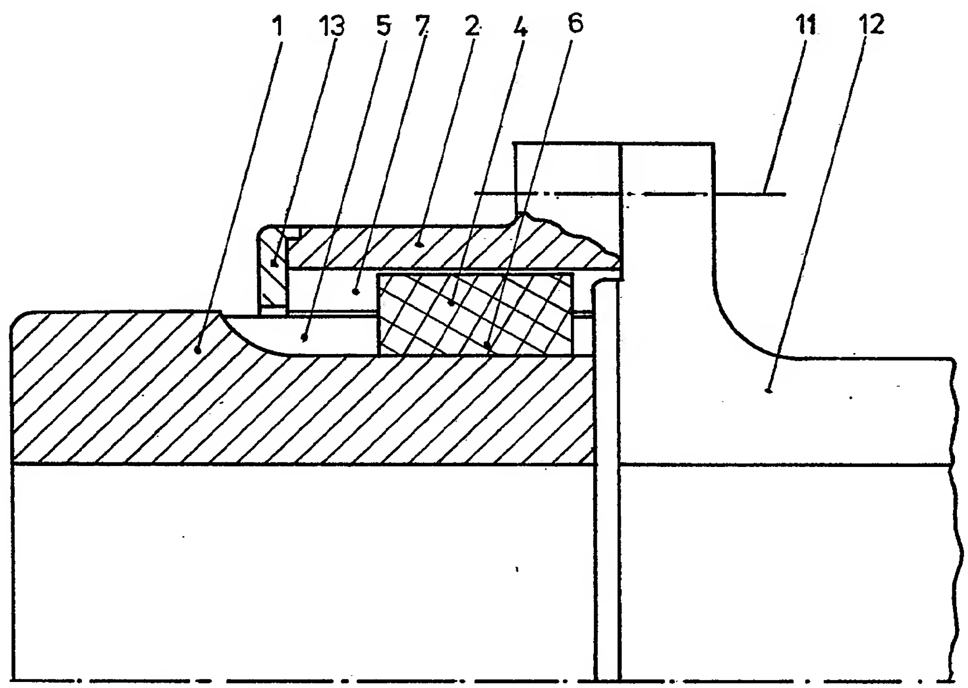


Fig.5